The CRUSHED STONE JOURNAL

PUBLISHED BY

The National Crushed Stone Association

751 Earle Building, Washington, D. C.

NO. 114 MARCH 1, 1926

Reports of Standing Committees Presented at Montreal Convention

COMMITTEE ON STANDARDS*

Your Committee on Standards encountered early in its activities the individual ideas of quarry operators and manufacturers as to the kind of equipment and machinery which they considered best. It required only a short investigation also to show that manufacturers in certain lines considered a particular style of equipment peculiar to that individual manufacturer as a part of his assets or stock in trade. Nevertheless, there appear to be a number of things which can be standardized without any considerable co-operation on the part of manufacturers. The gauge of quarry cars and the height of quarry cars come under this category.

The experience of those who have used narrow gauge equipment for 2' gauge and 3' gauge track and who have ultimately gone to the standard railroad gauge of 4' 8½" leads one to believe that the general adoption to the standard gauge for quarry cars would not work a hardship on operators generally. It is believed that the politic thing for those who are operating narrow gauge cars would be, in making replacement, if possible, to change to standard gauge. There seem to be few good reasons for the retention of the narrow gauge cars. This, however, like all adopted standardization equipment, is likely to meet with opposition from some operators.

The standardization of sizes of stone would apparently be beneficial to quarry-men throughout the country. At the present time, however, sizes are so affected by local conditions, as well as by State Highway Specifications and Engineers' and Architects' Specifications, that the standardization by the National Crushed Stone Association cannot be made effective without the co-operation of other organizations. In this connection there follows a suggested revision of the present Tentative

*Due to lack of space it was not possible to publish the entire report of the Committee on Standards in this issue and consequently the remainder of this report will be carried in the April issue.

(Continued Page 7)

COMMITTEE ON BALLAST

In preparation for the convention of the Association in Cincinnati in January of 1925 I sent out as Chairman of the Ballast Committee a questionnaire to every railroad in the United States and Canada. The questionnaire contemplated, as far as possible, the securing from the railroads the amount of ballasting they had done in the past, the amount done the previous year, and that which was contemplated for the season 1925.

In addition to this, the officials were asked if they subscribed to the order of merit which the various materials suitable for ballast possess as set forth on page 70 of the Manual of the American Railway Engineering Association of 1921. The order of merit referred to was substantially as follows:

Trap Rock or Granite.
Limestone or Sandstone.
Washed and Crushed Gravel.
Blast Furnace Slag.
Screened and Pit Run Gravel.

There was, however, no relative value of these various materials assigned in the manual. It was therefore sought to obtain the opinions as to the relative merits of these various substances, believing that the information would be of value both to the railroads and producers of the various articles.

Replies were received from fifty different railroads, aggregating a trackage of 110,359 miles, and these railroads represented 75% of the most important ones on the continent. A number of the replies were received subsequent to the convention in 1925 and many of them entirely too late to attempt to make any digest of the information. Such digest, however, was made for the convention of 1926 and below is a summary of these reports.

(Continued Page 2)

The CRUSHED STONE JOURNAL

J. R. BOYD, Editor

A. T. GOLDBECK, Director, Bureau of Engineering

The National Crushed Stone Association

OFFICERS

OTHO M. GRAVES, President
Drake Building
Easton, Pa.

J. R. BOYD, Secretary

JAMES SAVAGE, Treasurer

REGIONAL VICE-PRESIDENTS

A. R. Wilson, (Western) G. J. Whelan, (Central) Stirling Tomkins, (Eastern)
Thomas McCroskey, (Southern) W. R. Sanborn, (Northern)
C. M. Doolittle, (Canadian)

EXECUTIVE COMMITTEE

O. M. GRAVES, Chairman

H. E. Bair, F. R. Kanengeiser, F. W. Schmidt, W. Scott Eames, E. J. Krause, W. L. Sporborg

EX-PRESIDENTS

A. J. Blair, John Rice, E. J. Krause, W. Scott Eames, F. W. Schmidt, J. J. Sloan

JOIN THE NATIONAL CRUSHED STONE ASSOCIATION

The following remarks are addressed to those of you who are engaged in the Crushed Stone business but as yet are not members of this Association.

We have endeavored, through the columns of this publication, to inform you of the various activities of the organization in order that you might better realize the many benefits enjoyed by our members. In this issue you will find the proposed outline of work to be undertaken by the Bureau of Engineering. This program deserves the whole hearted support of every producer of Crushed Stone in the United States and Canada. We most cordially invite you to join with us and help us in our common problem, the advancement of the interests of the Crushed Stone industry. Membership application blanks may be obtained from the Secretary's office.

We regret that we must discontinue the practice of mailing the Crushed Stone Journal to producers who are not members of this Association. This publication is a service intended primarily for the members of this Association and in fairness to them it is felt that its circulation should be restricted to those who help to support it.

HIGHWAY MEETING AT RUTGERS COLLEGE

The National Crushed Stone Association was well represented at the short course in Highway Engineering given at Rutgers College, New Brunswick, New Jersey, during the past month. President Graves addressed the

(Continued Page 9)

Committee on Ballast

(Continued from Page 1)

"Do you subscribe to the order of merit which the various ballast materials possess as set forth on p. 70, Manual of the American Railway Engineering Assn. of 1921."

90 per cent answered Yes.

Number of miles of trackage under the jurisdiction of the fifty railroads answering—110,359.

	Relative percentage of merit	Estimated annual percentage of ballast in full ballasted track required for maintenance.
Trap rock or granite	100%	3.3%
Limestone or sandstone.....	87%	4.6%
Washed and crushed gravel...	78%	5.97%
Blast furnace slag.....	68%	7.9%
Screened and pit run gravel..	61%	9.9%

The difficulty of making this digest was due to the fact that very few engineers answered all the necessary questions and it was therefore necessary to supply by proportion, interpolation, and average such information in each report as was lacking and then finally average all the reports. The result is the average of all the reports, without giving weight to the opinions of more prominent engineers or engineers of the larger railroads as compared with engineers of lesser reputation, or those connected with smaller roads, for the reason that the mere size of the road did not necessarily imply that its representative's knowledge was in proportion to its size. At any rate, the result is an average of individual opinions and compiled as sincerely as was possible under the circumstances. Whether the results are right or wrong may be a matter of opinion, recognizing of course that average opinions at any rate do not represent truth.

Respectfully submitted,

JOHN RICE,
Chairman, Railroad Ballast Committee.

COMMITTEE ON RESEARCH

The report of the Research Committee must be largely prospective rather than retrospective. Pending the organizing of the Bureau of Engineering, it seemed best not to enter into a comprehensive program of organized research carried on through the various groups of stone producers. Conferences were had with various Highway Officials and attempts made to bring out certain important features in the behaviour of different aggregates under test and actual service conditions.

Primarily the Research Committee should function with and through the Bureau of Engineering, yet the field to be covered by the Bureau is so large and its facilities so limited, that it is vitally necessary that the Research Committee supplement the work of the Bureau with a vast amount of local work through a system of

(Continued Page 5)

The President's Page

The editor of the Journal has kindly offered me this page in each issue, with more space if it be required, to present to our members matters of more or less interest as they may arise from time to time.

It will be recalled that at the Montreal Convention Mr. Krause and Mr. Sanborn reported fully concerning the case presented by the Association in the action known as Ex Parte 87, being a part of Docket 17000, brought before the Interstate Commerce Commission by the western carriers seeking to increase the rates on various commodities about 5%, with a greater increase on certain commodities, among which crushed stone is one, the proposed increase on this material amounting to about 12%. The reports of these gentlemen, who have given so much of their time to this matter, will be printed in a subsequent issue.

It seems proper to acquaint you with certain portions of a lengthy and interesting report submitted to us by Mr. John S. Burchmore of Chicago, our general counsel in these proceedings. At the hearings in Kansas City, four witnesses testified in our behalf, namely, Messrs. W. R. Sanborn, John Dolese, John H. Kane (formerly Transportation Rate Expert of the Illinois Commerce Commission), and H. G. Wilson, Traffic Manager of the Columbia Quarry Company. Five exhibits were filed, in the preparation of which full use was made of the returns received from various members of the Association to the questionnaire sent out prior to the hearing. The opening argument by our counsel was to the effect that our Association had no testimony to offer as to whether or not the railroads required additional revenue, as that question would be decided by the Commission on all of the evidence offered by other interests. We contended that the increase of rates on crushed stone proposed would not increase revenue, due to the curtailment of movements, and that even if such increased rates would provide additional revenues, the increases should not be permitted for reasons to be brought out in the evidence presented by us.

Mr. Burchmore argued that state Public Service Commissions have found that previous advances in rates have been prohibitive of a free movement and that revenue was not necessarily increased by increasing the freight rates. Further, that as 90% of the movement of crushed stone was intrastate in the territory concerned, the I. C. C. should not enter an order which would enable the carriers to bring pressure upon the state commissions as prima facie evidence for these commissions to permit a general advance in intrastate rates. Carriers have not shown that their state rates on stone are subnormal and therefore there is nothing for the Association to rebut.

Mr. Burchmore announced that our witnesses would testify, first, as to the facts of the business; second, the history of freight rates on crushed stone; and, third, the probable effect of any further increase in those rates.

Mr. Wilson introduced exhibits and testimony indicating that the proposed increase in rates would diminish traffic and lessen revenue by stimulating truck hauls of local quarries. He testified relative to history of crushed stone freight rates and contended that this commodity has borne a disproportionate burden. He stated that a rate of 45c per ton in effect January 1, 1918, is now 88c per ton and if advanced as proposed by carriers, would become 95.5c per ton, a total increase of 112%. A rate of 45c on any other commodity in effect on January 1, 1918, and subsequently given straight percentage increases, including the 5% advance now requested by western carriers, would bring the rate to 75c, an advance of only 66.6%. He quoted from decisions of several Public Service Commissions and specifically from the Iowa Commission as follows:

> "From the testimony introduced we find that free movement of these commodities has been restricted by the high rates now in effect, and that to encourage such free movement the rates should be materially reduced.
>
> "These commodities are basic; if they cannot move, building of all kinds must cease."

Mr. Kane reviewed the history of rates on crushed stone, showing that they had been subjected to such heavy advances as to now place them on a high level. He introduced in substantiation various rate tables. Both he and Mr. Wilson stressed the already high car-mile earnings on crushed stone, its low value, heavy loading, no claims, etc.

Mr. Sanborn testified and introduced exhibits showing that the actual freight rates on crushed stone have increased from an average of about 52c for a haul of 109 miles to more than 90c, an increase of over 73%, while general class and commodity traffic has been advanced only 52% during the same period.

Mr. Dolese, testifying principally concerning Oklahoma and Iowa, stated that the proposed increase would circumscribe the movement of stone and prove a serious blow to carriers as well as producers.

Both Mr. Dolese and Mr. Sanborn emphasized the public interest in respect to increased cost of highway construction, public improvements and building generally if freight rates are further advanced on crushed stone and analogous materials.

(*Continued Page 4*)

The Hoch-Smith resolution, under which these proceedings are conducted, provides:

> "That it is hereby declared to be the true policy in rate making to be pursued by the Interstate Commerce Commission in adjusting freight rates, that the conditions which at any given time prevail in our several industries should be considered in so far as it is legally possible to do so, to the end that commodities may freely move."

This provision may be as properly invoked by the shippers of crushed stone as by the farmers, or anyone else.

The hearings have been concluded, briefs will be filed in March and April, after which the Commission will fix a date for oral argument and the decision will probably be made sometime during the summer.

Our counsel, Mr. Burchmore, expresses the opinion that the proposed advance of 75c per ton on crushed stone will not be granted.

In so far as circumstances permitted, our Association closely cooperated with the National Sand and Gravel Association.

Another freight rate proceeding of interest to the crushed stone industry is I. C. C. Docket 17763, Roquemore Gravel Company et al., Complainant, v. Alabama, Birmingham & Atlantic Railway, et al., Respondent.

We are informed that in this complaint, the gravel interests involved insist upon a differential for sand and unwashed gravel under slag and crushed stone. The carriers maintain that all such materials should take the same freight rate. Hearings have been held and concluded in Atlanta, Georgia. Argument is set before the Commission in Washington for March 12th.

Through local counsel in Atlanta we petitioned the I. C. C. for leave to intervene and be heard in oral argument and submit a written brief. We have before appeared before the Interstate Commerce Commission to argue that there is no transportation reason why gravel or slag should carry a lower freight rate than crushed stone. We expect to again argue along this line on March 12th.

We are of the opinion that the interests of our industry are as seriously threatened by an effort to have competitive commodities on a lower freight rate structure as by any proposal to impose a flat increase of rates on these commodities. In other words, we are certainly as much interested in preventing a discriminatory differential as in preventing a uniform increase. We believe that we can successfully defend the proposition that these aggregates should be on the same freight rate basis and that it is not the function of the carriers to discriminate against any one, thereby giving a trade advantage to the others. There are sound reasons in support of this proposition which we have advanced in the past and will again submit.

We are looking forward with pleasure to attending in the state in which this Association was born a meeting of crushed stone producers in Columbus on March 11th. The Ohio producers will be joined by those from Indiana and Michigan. State highway officials and division engineers are invited and expected, as well as a number of county road building officials. Mr. Goldbeck, the director of our Bureau of Engineering, will also attend.

We look for good to result to the industry and to the Association from this gathering.

Mr. Goldbeck and I had an interesting and instructive visit with Mr. MacDonald, Chief of the U. S. Bureau of Public Roads, last week. We are all aware of the value of this Bureau to road building in the United States. The several states not only receive Federal Aid dollar for dollar in the construction of seven per cent of their state highways, but have at their disposal the cooperative investigations conducted by the Bureau. The Bureau is to a large extent responsible for the scientific spirit which today permeates the building of highways and its advice and counsel are widely sought and followed. Mr. MacDonald is not only one of the outstanding authorities in highway construction, possessing a broad outlook as to the needs of the nation for transcontinental highways closely linked, as they must be, with state highway systems, but is also of that sympathetic and genial nature which creates warm friends and many of them.

Those crushed stone producers who know Mr. Bikle, general attorney of the Pennsylvania Railroad—and there are many in the East who possess that privilege and pleasure—will be interested in the following quotation from the Philadelphia Ledger of recent date concerning the petition presented to the Interstate Commerce Commission to permit the construction of a new railroad from Easton, Pa., to Pittsburgh, Pa., affording the D. L. & W., a western connection:

> "At the first hearing Charles E. Hughes presented the case for Mr. Loree's new road and was opposed by Henry W. Bikle, General Attorney of the Pennsylvania Railroad.
>
> "Mr. Bikle is a railroad lawyer used to appearing before the Interstate Commerce Commission. He had all the advantage of experience. Mr. Hughes made a fine speech but Mr. Bikle,

knowing the details and understanding the bodv before which he was appearing, had all the best of the argument.

"To a man knowing the subject, it was a case of a brilliant amateur facing a trained professional. And the Interstate Commerce Commission was not satisfied that a case for the new short line had been fully made."

Several years ago we found ourselves arguing before the I. C. C. with Mr. Bikle as a sypmathetic and helpful ally in his capacity as representative of the railroad interests. We decided then that we should much prefer to be on the same side of any question with him than to have it otherwise. Despite our somewhat stumbling efforts he later wrote: "I do not see how it could have been done better." Actually this was not a judgment of the merits of the argument, but a reflection of the graciousness of a courtly gentleman. Without prejudice to the issues of the case which has brought such distinguished counsel into action, we congratulate Mr. Bikle personally upon his continued success.

The Montreal Convention, aside from such instructive value as it may have had, has left a heritage of pleasant and happy memories to all who attended, if we are to judge by the kindly letters promptly written us by the distinguished highway engineers, railroad executives, and other guests who were with us at that time. They shared, as we hoped they would, the enjoyment of these days in this delightful Canadian city. Their letters, however, give expression to deeper thought, indicating a conception of the basic importance of this industry, the value of cooperative effort and inspiring confidence in the ability of our Bureau of Engineering to successfully carry forward the plans we have undertaken. That we are sincerely endeavoring to so point our activities as will enable crushed stone producers to more effectively and efficiently serve the market—and this without thought of material self-interest, seems to them as it does to us to possess practical idealism susceptible of ultimate fulfillment. An association, no less than an individual, should hold ideals and to know that those of our Association are in accord with intelligent opinion is properly gratifying and reassuring.

Elsewhere in this issue there is an outline of the work to be undertaken by the Bureau of Engineering as time may permit. Unquestionably all of it cannot be done in a year or two, but it is well to have definitely determined the scope, phase and character of our activities. You will be interested in reading this outline by Mr. Goldbeck and he would be glad to receive from you any comments or suggestions which may occur to you.

Committee on Research

(*Continued from Page 2*)

country-wide organization which would place on each individual producer the responsibility of certain work or certain territory.

It would appear desirable if in each local association or territory of not too great size, a particular member should be made responsible for research in that territory and that the individual members of that association should either be each made responsible for a particular county or larger division line of investigation on specific types of construction. The individual members could report on cases of failure and durability of specific roads made of the various aggregates under different conditions, past and prospective specifications, tests and official opinions.

Such reports might often be very informal, but could be made out with several carbon copies, one to the Bureau of Engineering, one to the Research Committee and one to the key member of the local association, or the key member could forward the information. Such reports should be briefly discussed at each local association meeting and a few minutes taken to question each member present as to any observations he has made since the last meeting. The gathering together and exchange of such data would not only be highly provocative of thought, but would result in the accumulation of information on the merits of stone.

Either separate Committees might be named in each local association to present the data already available or individual members could be assigned to various officials or bodies interested in road and other construction, to make sure that the latest test and service results were adequately presented to each of them.

Through the suggestion of the Bureau of Engineering individual members should be induced where possible to make such simple tests as would be of very material help to the Bureau with its present limited facilities.

An assignment should be made to individual members of the Research or Local Committees to each watch the reports or discussions of specific bodies such as Testing and Engineering bodies and also for particular individuals to watch particular technical or trade papers for data.

In this way we would have an ear or rather an eye to the ground in every part of the country, not only bringing to the Bureau of Engineering a vast amount of Suggestion and Survey, but also making available a large amount of information for immediate educational work.

Respectfully submitted,

FREDERICK C. MCKEE,
Chairman, Committee on Research.

COMMITTEE ON MEMBERSHIP

As chairman of the Membership Committee, I wish to report as follows:

Our Association was started in 1918 with sixty members and had in 1919 thirty members, in 1920 thirty-two members, in 1921 twenty-seven members and in 1922 twenty-six members. The dues in 1922 amounted to $7,111.41. This was, however, more than double the amount of money paid in as dues to our organization in 1918 when we had sixty members. This shows the spirit of our organization.

Up to 1923 the method of financing the Association was to collect funds by an assessment of so much per ton. At this time the Membership Plan was adopted whereby each membership held in the Association was at the rate of twenty-five dollars per membership per year.

In 1923, the first year under the new method we increased the number of active members to 73, holding 173 memberships. In 1924 there were ninety-five active members holding 202 memberships and during the past year, inclusive of the Montreal Convention, we have increased the number of active members to 171 holding 455 memberships. This shows an increase in memberships which is more than double that of the previous year and it is most pleasing for your chairman to report that we have brought into the organization during the past year seventy-eight new active members.

The Associate member feature of our Association was inaugurated in 1922, with sixteen members. This was increased in 1923 to forty-two, in 1924 to fifty-eight and in 1925, including the Montreal Convention, to seventy-eight. This is an increase during the past year of twenty new members.

I believe our members will be interested in the following data which shows our Association to be represented in twenty-nine States and Canada.

	ACTIVE MEMBERS		ASSOCIATE MEMBERS
State	No. of Firms	No. of Memberships	No. of Firms
California	4	9	0
Colorado	1	1	1
Connecticut	5	28	1
Delaware	2	3	3
Iowa	2	5	1
Illinois	15	36	9
Indiana	3	8	0
Kentucky	9	22	0
Maryland	1	2	1
Massachusetts	5	7	0
Michigan	1	7	0
Minnesota	5	10	1
Missouri	4	12	1
Nebraska	1	1	0
New Jersey	9	23	2
New York	19	63	9
No. Carolina	4	7	0
Oklahoma	2	3	0
Oregon	0	0	1
Ohio	23	85	20
Pennsylvania	16	44	17
Rhode Island	1	2	0
So. Carolina	4	8	0
So. Dakota	1	1	0
Tennessee	5	13	0
Texas	6	16	0
Virginia	7	11	0
W. Virginia	1	2	0
Wisconsin	7	12	6
Canada	8	14	5
Total	171	455	78

In view of the experience I have had with this work during the past year, I wish to offer the following suggestions:

All of you will agree with me, that this work must be carried on, and that we should try to increase our members each year, and try to bring into the organization every crushed stone producer in every State in the Union. The only way we can increase the memberships is by keeping at this work continuously and diligently. If we want to expand and broaden our activities, and if we want to keep up the good work, it is necessary, at all times, to keep up the interest in the Association, by retaining our present members, and by bringing new members into the Association. This will necessarily increase our funds each year, needed to carry on our work. This can only be accomplished by having an energetic and live Membership Committee, working at all times.

Of course, the research work and the advertising call for an increased expenditure of money, and I believe that the Membership Committee should be considered one of the most important Committees. In this connection, I would suggest that the Chairman of the Membership Committee be allowed to hold office for only one year, and that each year a new Chairman be appointed. This arrangement, I believe, would keep the interest in increasing memberships alive. Also I believe that on this committee there should be a representative from every State in the Union. It may be advantageous in some States, where there are a large number of plants, to have more than one member serve on the Membership Committee.

This Committee can keep before the producers, especially those who are not members of the Association, our literature showing them the work that this organization is doing, and the benefits that each operator will derive from the Bureau of Engineering, and other activities of the Associa-

tion. This will keep them interested in the Association, and will create a desire among those who are not members, to become members.

Every member of the Membership Committee should be furnished with a generous supply of literature and application blanks so that he can keep at all times data and facts before the producers in his territory who are not members of the National Crushed Stone Association, and no doubt in this way he will be successful in getting them to join us.

When our Bureau of Engineering has become more fully established, and the stone producers begin to realize the many opportunities and advantages of being members of our Association, I believe it would be a good plan to have our Secretary, accompanied by the member of the Membership Committee in that territory, visit the districts where there is a lack of interest, have central meetings of those producers, and try to get them to join the Association. If this committee will spend some time and will work continuously on the problem of increasing the individual memberships in our Association, I am sure it will accomplish some good results, show a substantial increase each year, bring into the organization enough additional members and funds to enable us to increase our program for research work, and also advertise the advantages of crushed stone and its allied products.

May I offer the further suggestion, that we inaugurate a system of classing our members into groups to try and equalize the dues paid in to our organization. In my correspondence during the year in conducting our campaign for new members, I found in many instances that certain members when asked to increase their memberships came back with a letter stating that they believe they held as many memberships as their neighbors, or that a certain organization which was doing more business held a certain number of memberships, and on this account they did not feel like increasing their memberships. I believe that if we would put our members into certain groups along the following lines that we would get better results, increase the revenues, and also make our members better satisfied. I would suggest that we set a maximum amount of dues that each member would pay at $500, and a minimum amount at $25, and grade between these two limits as follows:

Group	Yearly Production in Tons	Dues
A	500,000 or over	$500
B	400,000—500,000	400
C	300,000—400,000	300
D	200,000—300,000	200
E	100,000—200,000	100
F	50,000—100,000	50
G	Less than 50,000	25

Respectfully submitted,

R. B. Tyler,

Chairman, Membership Committee.

Committee on Standards

(*Continued from Page 1*)

Standard Specification for Commercial Sizes of Broken Stone and Broken Slag, Serial Designation, D63-23T, of the American Society for Testing Materials. This is published as information and for study by members of the National Crushed Stone Association. Should the American Society for Testing Materials adopt a standard, it is quite probable that such standard should also be made the standard of the National Crushed Stone Association. It would be folly for this Association to attempt to establish a standard at variance from that of the American Society for Testing Materials.

Let it be understood, therefore, that the including of this proposed revision of sizes of crushed stone is not in any sense a recommendation of your Committee but only information that should be of interest to members of this Association.

SUGGESTED TENTATIVE SPECIFICATIONS For COMMERCIAL SIZES OF BROKEN STONE AND BROKEN SLAG FOR HIGHWAY CONSTRUCTION

1. These specifications cover the standard size designations and maximum permissible range in mechanical analysis for twelve commercial grades of broken stone and broken slag, when used in the construction of plain or bituminous macadam, bituminous concrete, sheet asphalt and cement-concrete roads and pavements.

Manufacture.

2. The standard sizes herein specified may be produced from the run of the crusher by means of any screening process in which the factors influencing the efficiency of the screening operation are so adjusted that the designated sizes will conform to the requirements for mechanical analysis specified in Section 4.

Standard Sizes.

3. Each of the standard sizes shall be designated by reference to both the upper and lower nominal limiting size of the product: thus, "¼ to ¾-in. size" indicating that portion of the product of a crusher, all of which is nominally between ¼ and ¾ in. in size.

Permissible Variations in Mechanical Analysis.

4. The designated size for each grade together with the corresponding maximum permissible variations in mechanical analysis as determined by the use of laboratory screens, are given in the following table:

(*Continued Page 8*)

(Continued from Page 7)

MAXIMUM PERMISSIBLE RANGE IN MECHANICAL ANALYSIS FOR EACH SIZE

(Percentage by weight passing laboratory screens)

Designated Size *	Diameter of Laboratory Screen Circular Openings Inches										
inches	¼	½	¾	1	1¼	1½	2	2½	3	3½	4
0- ¼[a]	85-100	100	....	....	....	....	....	....	....	....	....
0- ½[a]	15-75	95-100	100	....	....	....	....	....	....	....	....
0- ¾[a]	15-75	....	95-100	100	....	....	....	....	....	....	....
¼- ½	0-15	95-100	100	....	....	....	....	....	....	....	....
¼- ¾	0-15	25-75	95-100	100	....	....	....	....	....	....	....
¼-1¼	0-5	....	40-75	....	95-100	100	....	....	....	....	....
¼-2	0-5	5-25	....	40-75	....	....	95-100	100	....	....	....
¼-2½	0-5	....	10-25	....	40-75	....	....	95-100	100	....	....
½-1	0	0-15	25-75	95-100	100	....	....	....	....	....	....
¾-1¼	....	....	0-15	25-75	95-100	100	....	....	....	....	....
1¼-2½	....	....	....	....	0-15	....	25-75	95-100	100	....	....
2½-3½[b]	....	....	....	....	....	....	....	0-15	25-75	95-100	....

a. Designated Sizes 0-¼, 0-½, and 0-¾, when used as screenings in waterbound macadam road construction shall conform to the following additional requirements: Passing No. 100-mesh sieve, 6-12%.

b. The lower limit for Designated Size 2½-3½ may be changed to 2", when necessary to utilize the product of a crusher producing Designated Size ¼-2".

The upper limit for Designated Size 2½-3½ may be changed to 4" in the case of very soft stone or light or porous slag.

*Note: Stone would be known commercially according to the sizes given in this column; thus, ¼ to 1¼ in. stone, ¾ to 1¼ in. stone, etc.

Size of Samples.

5. Samples of broken stone or broken slag which are to be examined to determine conformity with these specifications shall weigh at least 50 times the weight of the largest piece therein and be strictly representative of the product sampled.

Explanatory Statement.

The commercial sizes designated in the accompanying proposed specifications provide primarily for the separation of the run of crusher into five sizes not including the 0 to½-in. size. Although the limiting sizes were determined after carefully considering the size requirements of the various types of roads using broken stone or slag, no definite requirements regarding use have been inserted, as such requirements will be included in specifications which are to be prepared by Committee D-4. It will be noted that a general tolerance of 15 per cent on the lower limiting size and 5 per cent on the upper limiting size for each grade is specified. It is felt that this will cover all unavoidable variations in grading of a given designated product. An intermediate size requirement of from 25 to 75 per cent is also given for the ¼ to ¾-in., the ¾ to 1¼-in., the ½ to 1-in., 1¼ to 2½-in., and the 2½ to 3½-in. sizes. For the combination sizes which will ordinarily be used in cement-concrete work, a lower tolerance of 5 per cent is specified. In Table I various uses to which the different grades are adapted are indicated:

Table I.

Various Uses for Which the Different Grades of Stone Are Adapted.

Designated Size, in.	Suggested Uses.
0—¼	Fine screenings for Waterbound road construction.
0—½	Aggregate for fine graded bituminous concrete.
0—¾	Coarse screenings for waterbound macadam road construction or aggregate for bituminous concrete.
¼—½	Fine dustless screenings for bituminous road construction.
¼—¾	Coarse dustless screenings for bituminous road construction; Coarse aggregate for cement concrete where the maximum size is limited to ¾".
¼—1¼	Coarse aggregate for coarse graded bituminous concrete; Coarse aggregate for cement concrete where the maximum size is limited to 1¼".
¼—2	Coarse aggregate for cement concrete pavements or other concrete structures where the maximum size is limited to 2".

¼—2½	Coarse aggregate for cement concrete pavements or other concrete structures where the maximum size is limited to 2½". As coarse aggregate for bituminous concrete base.
½—1	Commercial ¾" stone for bituminous road construction.
¾—1¼	Commercial 1" stone for bituminous road construction; Binder stone for sheet asphalt, etc.
1¼—2½	Coarse aggregate for bituminous macadam penetration method and bituminous macadam base; also wear course waterbound macadam.
2½—3½	Coarse aggregate for bituminous macadam base or base course waterbound macadam.

CRITICISMS OF THIS STANDARD ALREADY RECEIVED BY THE ROAD MATERIALS COMMITTEE OF THE A. S. T. M.

Designated Size 0—¼". Attention was called to the necessity for controlling the amount of fine material in screenings for waterbound macadam. It was proposed to handle this by a footnote as shown.

Designated Size 0—½". This size was criticized because it represented not only a product containing a large percentage of crusher dust (75%), but also included material none of which passed the ¼" screen. It was felt that these were different products used for two distinct purposes. For this reason the 0—½" size in the new table carries 15-75% passing the ¼", and a new size (¼"—½") has been inserted to provide for the need of ½"—¼" dustless screenings.

Designated Size 0—¾". This size was criticized mainly because of the fact that a larger proportion of material is allowed to pass the ¼" than in the case of the 0—½" size, whereas the reverse would probably be the case in the ordinary run of the crusher. Accordingly, the per cent passing the ¼" for this size has been changed to 15-75 instead of 40-80. The object of the 15 per cent limit is to prevent over-lapping with the ¼"—¾" size. which provides for as much as 15% below the ¼" screen.

Designated Size ¼"—¾" was not criticized.

Designated Size ¼"—1¼" was criticized on account of low minimum limit passing the ¾" screen, 25%. This limit has been changed to 40%. because it was felt that a more satisfactorily graded aggregate for concrete would thereby be secured.

Designated Size ¼"—2½" was very severely criticized by a number of engineers in connection with its use as coarse aggregate in concrete road construction. The principal objections were that the range in sizes was not closely enough defined and that a product entirely too coarse graded for satisfactory results would be possible under this specification. It was also criticized by a number of engineers because of the maximum size of 2½", the statement being made that in the majority of States having large concrete paving programs the maximum size was 2". Accordingly, another size has been inserted to be known as Designated Size ¼"—2", with permissible variations as indicated in the table, and corresponding changes in permissible variations made in Designated Size ¼"—2½". It will be observed that limits on an additional screen are inserted in both cases, the ½" screen being used for the ¼"—2" size and the ¾" screen for the ¼"—2½" size. The object of limits on these sizes is of course apparent, in that a certain amount of fine material is thereby insured.

Designated Size ¾"—1¼" was not criticized.

Designated Size ¼"—2½" was criticized on account of the fact that there was no intermediate screen size specified. This addition was accordingly made in the new table. In addition to the above changes, it will be observed that 100% must pass in all cases the screen next larger in size to the maximum nominal size of the product.

Very strong representation was also made regarding the necessity for an additional size vs. ½"—1". or commercial ¾" stone. This size has been inserted together with corresponding permissible range in mechanical analysis.

Submit Your Criticisms

The adoption of a uniform standard of stone sizes throughout the country would be highly beneficial to all crushed stone producers, for it would eliminate a great deal of expense due to the necessity for frequent changes in plant screens, expense due to misunderstandings as to exactly what sizes were required and finally there should result a decrease in the number of sizes of stone produced. The net effect should be simplification and decrease of expense of production. Every crushed stone producer should show his interest in this standard. It promises to be highly important to all. Show your interest, whether or not you are members of the National Crushed Stone Association, by sending your suggestions and criticisms addressed to

National Crushed Stone Association,
Bureau of Engineering,
751 Earle Building,
Washington, D. C.

(*Continued from Page 2*)

Smoker held on Friday evening, February 19, and was given a very enthusiastic welcome. On the afternoon of February 11, Mr. Goldbeck delivered an illustrated lecture on, "Researches on the Design of Concrete Pavements."

Proposed Outline of Work to be Undertaken by the Bureau of Engineering National Crushed Stone Association

The following work program lists the various activities which are proposed to be undertaken by the Bureau of Engineering, some of them this year, others in the future. It is published here for the purpose of eliciting helpful criticism. The various projects will be handled in the order of their importance and completed as rapidly as circumstances permit. Your suggestions will be welcomed.

GENERAL LINES OF PROCEDURE

A. Supply Facts to Benefit Users and Producers of Crushed Stone.

B. Assist in the Improvement of the Design of Roads of All Types Utilizing Crushed Stone.

C. Investigate the Merits of Stone for Various Types of Construction.

D. Discover Means for Improving the Quality of Crushed Stone.

E. Discover Means for Utilizing Waste Products.

F. Discover Means for Decreasing Cost of Production.

G. Obtain Statistical Information on the Stone Industry.

H. Miscellaneous Work of a Special Nature.

A. Supply Facts to Benefit Users and Producers of Crushed Stone.

1. Write technical articles helpful along this line.
2. Write set of standard specifications covering materials and construction.
3. Write articles suggesting new procedure in construction.
4. Write articles showing how crushed stone might best be used for various purposes, including road construction, mine dusting, in agriculture, sewage disposal, concrete in structures, concrete products, etc.
5. Make investigations of aggregates from the standpoint of economy.

B. Assist in the Improvement of the Design of Roads of All Types Utilizing Crushed Stone.

1. Continue Studies of concrete road design, particularly as regards construction on bad subgrades—possibilities of "blanket" course.
2. Make studies of the mechanics of macadam types with the idea of suggesting improvements in their design.
3. Assist in making field investigations on experimental sections of macadam and allied types.
4. Study the effect of "blanket" course in stabilizing subgrade and preventing clay intrusion.
5. Study best size of stone for use in concrete, bituminous macadam, bituminous concrete, broken stone bases and macadam.

C. Investigate the Merits of Stone for Various Types of Construction.

1. Field investigation of concrete roads containing stone, gravel and slag, for service behavior. Possibly this can best be undertaken by the National Research Council, in cooperation with other aggregate producers.
2. Get maintenance data on roads of various types from all available sources, covering all types of construction. (By correspondence, review of literature, tabulation.)
3. Initiate research on concrete in various laboratories covering:
   - (a) repeated load tests.
   - (b) repeated impacts.
   - (c) direct tension.
   - (d) cross-bending.
   - (e) alternate freezing and thawing.
   - (f) established relation of sodium sulphate test and other accelerated tests with freezing and thawing.
   - (g) screenings for use in concrete.

(This would require work to be done in at least 9 laboratories and as many more as possible. Preliminary work could well be done in a laboratory of our own.)

4. Start tests on effect of sewage effluent on stone.

D. Discover Means for Improving the Quality of Crushed Stone.

1. Study best means for having the right sizes delivered on the job.
   (a) Make a study of mechanical analysis as affected by:
      1. Method of loading the bin.
      2. Method of loading the car.
      3. Special contrivances to prevent segregation during loading of car.
      4. Shipment in car.
      5. Stock piling.
2. Study the relation of sizes as determined in the laboratory and as made commercially. (Translate laboratory screen sizes into plant screen sizes.)
3. Make a study of washing stone and its effects.
4. Study means for producing and utilizing stone from quarries which contain unusable portions.

E. Discover Means for Utilizing Waste Products.

The waste products are largely, (A) Screenings, (B) Stone Dust.

Procedure:—

(A) Screenings.

1. Review literature covering use of screenings:
   (a) as a fine aggregate in concrete,
   (b) as a subgrade treatment,
   (c) for use in concrete products,
   (d) in asphalt mixtures,
   (e) for use as cover treatment on oiled roads.
2. Draw up outlines of research along the above lines and have researches carried out.
3. Design roads involving screenings and have experimental stretches built.

(B) Stone Dust.

1. Review literature covering the use of dusts of various kinds to discover possibilities of uses for stone dust.
2. Cooperate with the Bureau of Mines and other agencies along this line.
3. Initiate researches on use of various dusts for asphalt filler or for other purposes which suggest themselves.

F. Discover Means for Decreasing Cost of Production.

The various means are:—

1. Standardization of Sizes.
2. Standardization of Equipment.
3. Accident Prevention.
4. Decreasing Fire Hazard.
5. Study of Quarry Operations.

Procedure:—

1. Standardization of Sizes.

   Use the present American Society for Testing Materials Specifications as a basis. Assist Committee on Standards in every way possible to accomplish uniform standard of sizes. Work also with other technical societies to bring about universal standard.

2. Standardization of Equipment.

   Investigate screening efficiency of all types of screens. Assist Committee on Standards in gathering needed information.

3. Accident Prevention.

   Investigate possibility of bringing about a national safety code applicable to the quarry industry. Work in cooperation with proper agencies such as National Safety Council, American Engineering Standards Committee, etc.

4. Decrease Fire Hazard.

   Look up literature. Study the various possibilities along this line.

5. Study of quarry operation.

   Investigate and publish any unusual information along this line.

G. Statistical Information on the Stone Industry.

1. Stone production by geographical districts.
2. Stone costs.

H. Miscellaneous Work of a Special Nature.

1. Make for elimination of peak loads in production.

NEW MEMBERS

The following firms have become members of the N. C. S. A. since the publication of Journal No. 113.

Active

4 Piedmont Corporation, Atlanta, Ga.
2 The Sowerbutt Quarries, Paterson, N. J.